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## ABSTRACT

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A local vapor fuel cell, comprising (A) an anode receiving a liquid fuel from a liquid fuel source substantially through diffusion; (B) an electrolyte plate having a first surface adjacent to the anode; and (C) a cathode adjacent to a second surface of the electrolyte plate and opposite to the anode. The anode is provided with a heating environment to at least partially vaporize the liquid fuel inside the anode and the anode further comprises a catalyst phase to ionize the fuel in a vapor or vapor-liquid mixture form to produce protons. The electro-catalytic reaction at the anode is more efficient with a vapor phase or vapor-liquid mixture than with liquid fuel alone.

11

The invented fuel cell is compact in size and light in weight and, hence, is particularly useful for powering small microelectronic devices such as a notebook computer, a personal digital assistant, a mobile phone, and a digital camera.